LOWER COLORADO RIVER RECLAMATION

The Lower Colorado River Basin presents an impressive array of benefits from the Reclamation Act of 1902 and the numerous multipurpose water programs the law authorizes. Bureau of Reclamation projects along the lower Colorado have contributed greatly to the Pacific Southwest's tremendous development. These projects play a major role in plans to meet the continuing and growing needs of the region and the Nation for food and fiber, energy and water, jobs and recreation.

Reclamation-constructed works irrigate about a million acres of land in the lower Colorado River Basin. Water stored and regulated by Hoover and other Reclamation dams supplements the municipal and industrial needs of approximately 11 million people and generates an average of 5.7 billion kilowatt-hours of pollution-free hydroelectric energy annually. The clear reservoirs and river stretches created by these dams provide recreational opportunities and fish and wildlife habitats.

With recent additional growth in the Southwest, the need for water and electric power is increasing at an alarming rate. Greater demands are being placed upon the region's water resources. New Reclamation projects are being planned and existing operations are being improved and updated to meet these new challenges.

This publication gives you a project-by-project sketch of the Reclamation program in the Lower Colorado Region, one of Reclamation's seven regions in the Western States.

LOWER COLORADO DAMS PROJECT

Operation and maintenance of Hoover, Davis, and Parker Dams is consolidated administratively in the Lower Colorado Dams Project Office. All three dams are operated under provisions of legislative acts which authorized them. Merging the administration of the three hydroelectric dams is a result of a transfer of Reclamation's electrical marketing and transmission responsibilities to the Western Area Power Administration of the U.S. Department of Energy.

HOOVER DAM

Hoover Dam—selected by the American Society of Civil Engineers as one of this Nation's Seven Modern Civil Engineering Wonders—is the key feature of the Boulder Canyon Project, authorized in 1928.

Hoover Dam provides maximum Reclamation multipurpose benefits—flood protection; river control; water storage and conservation of water for irrigation and municipal and industrial uses; generation of clean, low-cost hydroelectric energy; improvement of navigation; recreation; and preservation of fish and wildlife.

Located on the Colorado River between Nevada and Arizona, this concrete arch gravity-type dam, the greatest such structure of its day, rises 726.4 feet above bedrock. Its reservoir, Lake Mead, backing up 110 miles behind the dam and capable of storing more than 30 million acre-feet of available water, is this hemisphere's largest manmade reservoir.

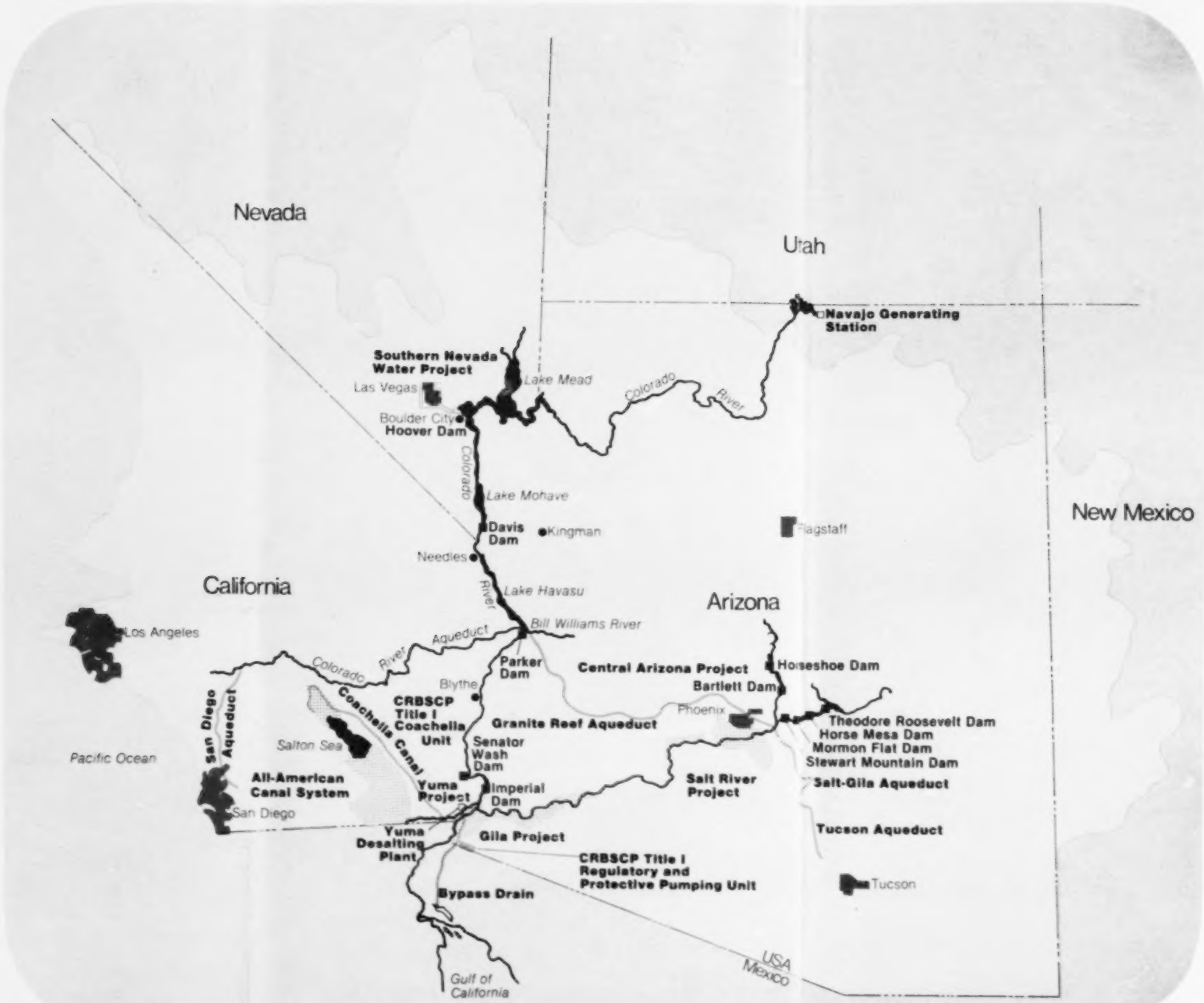
Under supervision of the National Park Service, the Lake Mead National Recreation Area, including Lakes Mead and Mohave, attracts more than 8 million visitors each year.

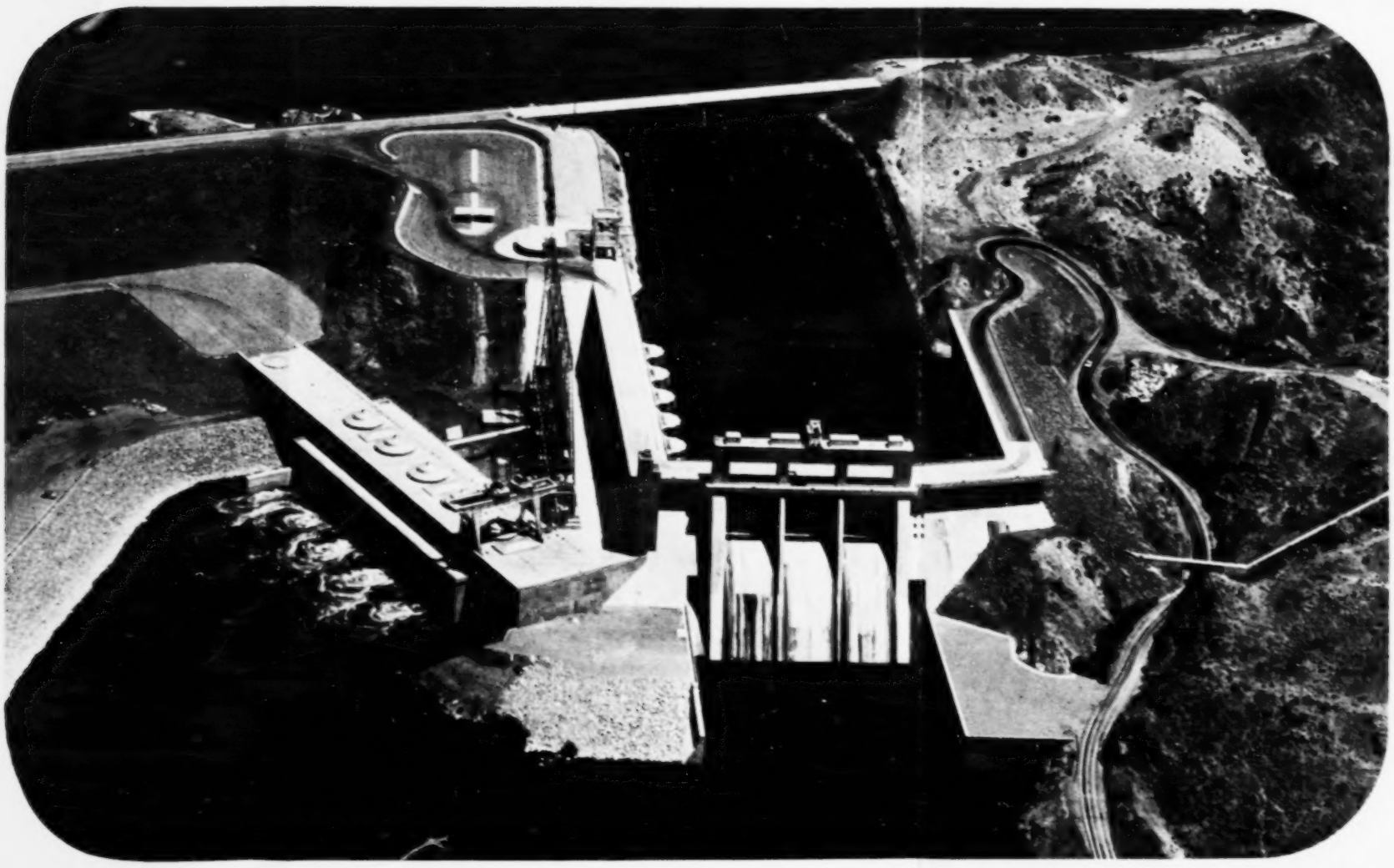
Construction of Hoover Dam started in 1931 and was completed in 1935. The Hoover Powerplant generated its first commercial power on October 26, 1936. The 17th and last generator was placed in commercial operation on December 1, 1961, raising the plant's nameplate capacity to 1,344,800 kilowatts.

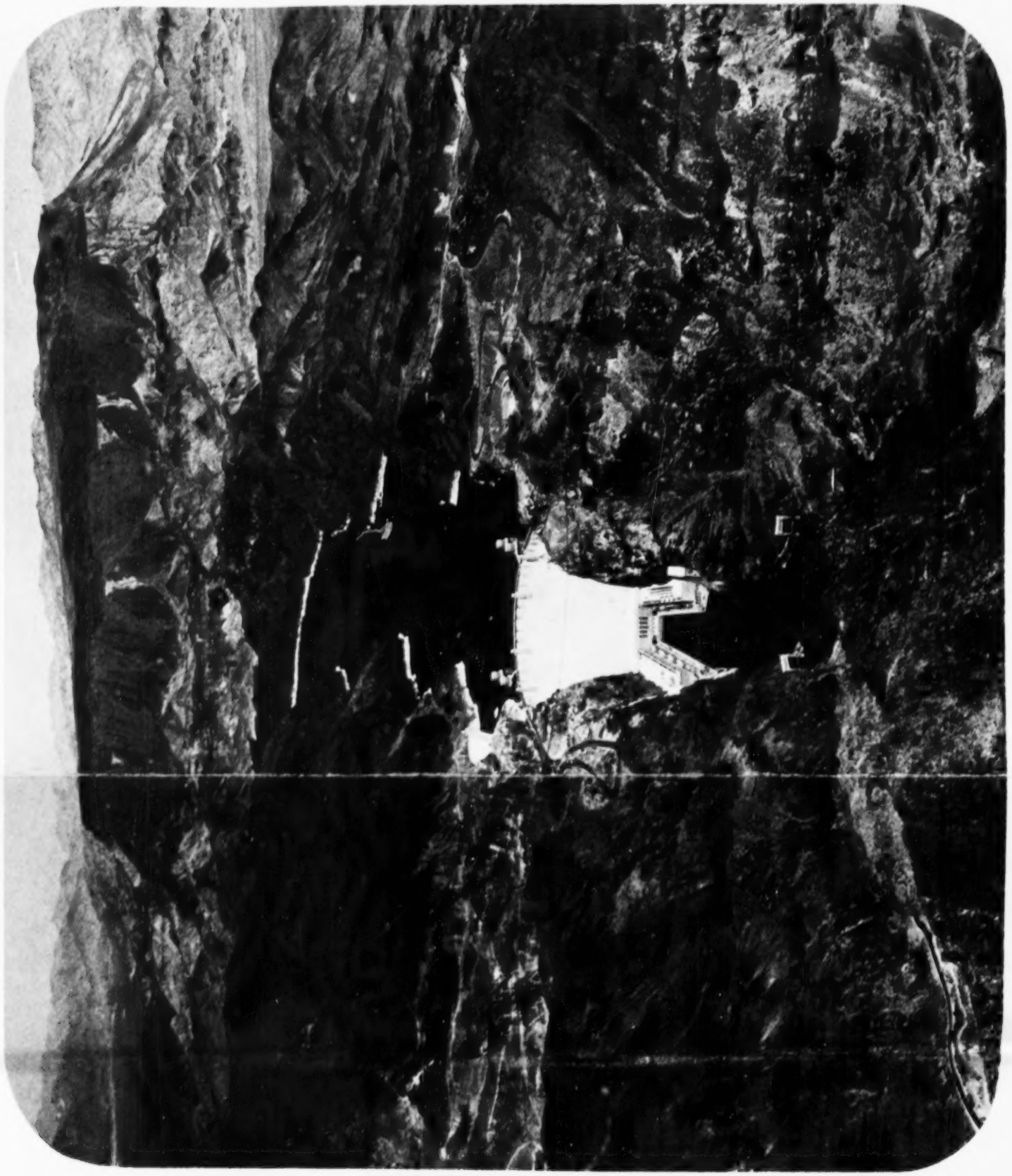
DAVIS DAM

Davis Dam was built primarily for regulation of Colorado River water delivered to Mexico at the International Boundary, as required by the Mexican Water Treaty. The reservoir, Lake Mohave, is used for that purpose through integrated operations of the Hoover and Davis Powerplants. Recreation and fish and wildlife preservation are also among Davis Dam's benefits. The Davis Powerplant—with an installed capacity of 240,000 kilowatts—teams with the Hoover and Parker Powerplants to serve markets in the Pacific Southwest.

Davis Dam and its reservoir—Lake Mohave.


Nevada
Utah
New Mexico
California
Arizona
Navajo Generating Station
Southern Nevada Water Project
Las Vegas
Lake Mead
Colorado River
Boulder City
Hoover Dam
Colorado River
Lake Mohave
Davis Dam
Kingman
Flagstaff
Needles
Colorado River
Lake Havasu
Bill Williams River
Los Angeles
Colorado River Aqueduct
Parker Dam
Central Arizona Project
Horseshoe Dam
Bartlett Dam
Blythe
CRBSCP Title I Coachella Unit
Coachella Canal
Granite Reef Aqueduct
Phoenix
Theodore Roosevelt Dam
Horse Mesa Dam
Mormon Flat Dam
Stewart Mountain Dam
San Diego Aqueduct
Salton Sea
Pacific Ocean
Senator Wash Dam
All-American Canal System
Yuma Project
Imperial Dam
Salt River Project
Salt-Gila Aqueduct
San Diego
Tucson Aqueduct
Yuma Desalting Plant
Gila Project
CRBSCP Title I Regulatory and Protective Pumping Unit
Tucson
Bypass Drain
USA
Mexico
Gulf of California





SOUTHERN NEVADA WATER PROJECT

The first stage of the Southern Nevada Water Project since 1971 has been delivering municipal and industrial water from Lake Mead to one of the fastest growing areas in the nation—the Las Vegas Valley Water District, North Las Vegas, Henderson, Boulder City, and Nellis Air Force Base. Construction of the project's second stage began in June 1977 and is scheduled to go into operation in 1981. The two stages will be capable of delivering annually up to 299,000 acre-feet of Colorado River water, approximately all of Nevada's allotment. The project is being constructed jointly by the Bureau of Reclamation and the State of Nevada.

First stage works consist of the Lake Mead intake facilities, a 3-mile main aqueduct, a 4-mile tunnel through the River Mountains, 8 pumping plants and over 31 miles of pipeline laterals.

The second stage will enlarge the first stage by expanding some of the existing facilities and by adding five new pumping plants, the second barrel to the main aqueduct, and about 30 miles of new pipeline laterals.

As part of the first stage, Nevada's Division of Colorado River Resources constructed the Alfred Merritt Smith Water Treatment Facility at Lake Mead. Capacity of this treatment plant is being doubled to 400 million gallons per day to accommodate the additional water through the second stage.

COLORADO RIVER FRONT WORK and LEVEE SYSTEM

The Colorado River Front Work and Levee System (CRFW&LS), authorized in 1925, is designed to control the Colorado River from Lee Ferry, Arizona (division point between the upper and lower basins) to the southernmost International Boundary with Mexico, a distance of about 700 miles.

Since 1949, Reclamation has carried out an extensive river management program along the Colorado River below Davis Dam which is the major activity of the CRFW&LS. The primary work goals of this multipurpose program are: flood control, sediment control, water savings, fish and wildlife preservation, recreational development, navigational improvement, salinity control, drainage improvement on adjacent agricultural lands, river regulation, protection of the environment, and economic enhancement of land values.

Thirty-two miles of the river in the Mohave Valley downstream from Davis Dam, 16 miles of the river in the Cibola Valley south of Blythe, California, and 5 miles of the river in the North Gila Valley below Laguna Dam have been improved. This has changed the river from a shallow, braided, actively meandering stream to a deeper and more narrow channel having a more uniform gradient and an improved channel alignment. Water formerly lost is thus saved for much-needed use by farms and cities in the arid southwest.

Portions of the river in the Parker and Palo Verde Valleys have been stabilized by land-based equipment. The completed work consists primarily of jetties and river-training and bankline-protective structures. Two sediment settling basins—one above Topock, Arizona, and the other below Imperial Dam—have been created to trap large quantities of sediment eroded from upstream sources. Dredges pump the sediment from each basin onto adjoining land as required.

PALO VERDE DIVERSION PROJECT

Palo Verde Diversion Dam was completed in 1957. The 1,300-foot-long, 50-foot-high, earth- and rock-fill dam spans the Colorado River 214 miles downstream from Hoover Dam. It diverts water into the Palo Verde Irrigation District's canal system, serving 92,000 acres in California's Palo Verde Valley.

A drain 21 miles long and a levee 30 miles long on the Arizona side upstream from the dam are features of the project. These works protect lands on the Colorado River Indian Reservation against floods and also intercept drainage water.

The dam provides farmers in the Palo Verde Valley with their first assured means of obtaining water by gravity diversion.

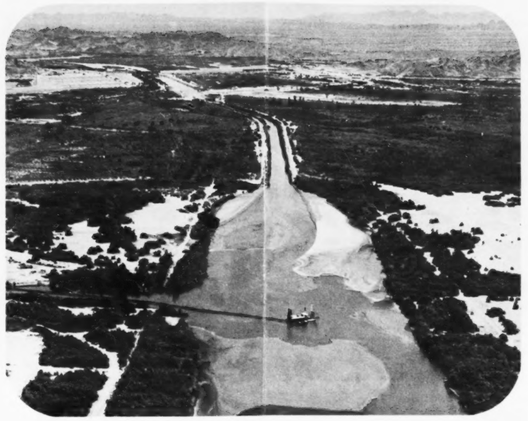
SENATOR WASH DAM and REGULATING RESERVOIR

Senator Wash Dam and Regulating Reservoir is an off-stream pumping-generating development on the California side of the Colorado River, 2 miles upstream from Imperial Dam. This 94-foot-high earthfill embankment structure and its reservoir are designed to save water and improve deliveries to water users in the United States and Mexico.

Water in excess of scheduled deliveries is lifted from the river behind Imperial Dam into the regulating reservoir by six dual-purpose pump generators. With a usable capacity of 12,250 acre-feet, the reservoir saves up to 170,000 acre-feet of water a year, enough to irrigate 27,000 acres of land or supply the municipal and industrial needs of a half-million people.

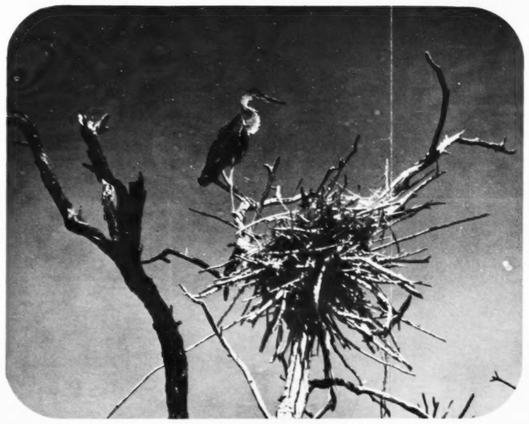
As water releases are made back to the river, hydroelectric energy is generated and fed into the Western Area Power Administration's transmission system. The pump generators have a rated generating capacity of 1,200 kilowatts each for a total of 7,200 kilowatts. The sale of this power helps offset the cost for pumping. The facility, built under the Colorado River Front Work and Levee System Program, also provides recreation and fish and wildlife opportunities.

Water treatment facility, looking southeast, with Lake Mead in background.



The dredge "Gila" in the Laguna settling basin below Imperial Dam pumps sediment eroded from upstream.

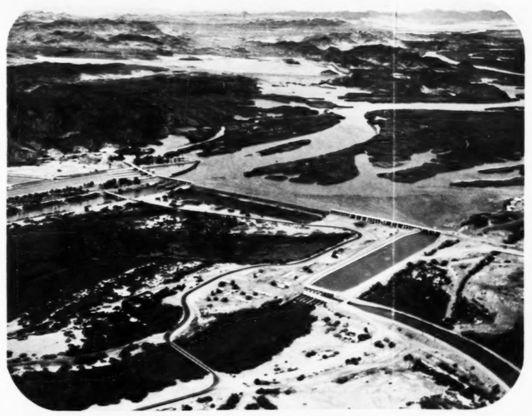
Harvesting lettuce in the Dome Valley near Yuma, Arizona. The crop is cut, packed and loaded for direct shipment.



Great Blue Heron in Topock Marsh.

Palo Verde Diversion Dam diverts water to irrigate 92,000 acres of farmland in Palo Verde Valley.

Water from Gila Gravity Main Canal has flowed and stood for over irrigated farmland.



Imperial Dam is 300 miles below Hoover. Its desilting works prevent riverbed sediments from entering the canals and reducing the flows.

Senator Wash Dam and Regulating Reservoir saves up to 170,000 acre-feet of water annually for U.S. and Mexican users.

Some 100,000 Coachella Valley acres can be irrigated by Coachella Main Canal water.

IMPERIAL DAM and DESILTING WORKS

Imperial Dam, 300 miles below Hoover, diverts water from the Colorado River on the California side into the All-American Canal and on the Arizona side into the Gila Gravity Main Canal. The All-American Canal delivers water to the Imperial and Coachella Valleys of southern California and to the Yuma Project in southwestern Arizona and southeastern California. The Gila Gravity Main Canal carries water to the Gila and Yuma Auxiliary Projects.

The All-American Canal has a capacity of 15,155 cubic feet per second, and the Gila Gravity Main Canal 2,200 cubic feet per second. Imperial Dam, 3,475 feet long, raises the river level 23 feet at the dam. Construction of the dam and desilting works began in 1936 and was completed in 1938. The desilting works prevent vast quantities of riverbed sediment from entering the canals and creating operation and maintenance difficulties.

YUMA PROJECT

This is the oldest Reclamation development on the Colorado River and one of the first to be authorized (1904) and constructed. About 53,000 of the project's 68,000 irrigable acres lie in Arizona and the remainder in California.

Laguna Dam, 13 miles north of Yuma on the Colorado River, was the project's original diversion structure. Construction started in 1905 and was completed in 1909. First water deliveries began in 1910.

Water for the project is diverted into the All-American Canal at Imperial Dam, 5 miles upstream from Laguna. The project's 1,600-kilowatt Siphon Drop Powerplant generated the first hydroelectric energy on the Colorado River in 1926. The obsolete plant was shut down in 1972 and studies to rehabilitate or replace it are now underway.

Yuma Valley produces alfalfa hay and seed, winter vegetables, cantaloupes and watermelons, cotton, sorghum and small grains, pasture crops, and some citrus. Feed crops provide for the seasonal feeding and pasturing of livestock.

ALL-AMERICAN CANAL SYSTEM

The All-American Canal System—including Imperial Dam and Desilting Works on the Colorado River, the All-American Canal and its major branch, the Coachella Main Canal—was authorized under the Boulder Canyon Project Act of 1928.

The All-American Canal proper can serve about 530,000 irrigable acres of land on the Imperial Division, while the Coachella Main Canal can deliver water to some 78,000 acres on the Coachella Division, both in southern California. The All-American Canal also furnishes water to 68,000 acres on the Yuma Project in California and Arizona.

Hydroelectric energy is generated at plants constructed by the Imperial Irrigation District on the All-American Canal at Drops Nos. 2, 3, and 4, and at Pilot Knob Check and Wasteway.

Started in 1934, the All-American Canal delivered its first water to Imperial Valley in 1941. One of the world's largest canals, it extends westward 80 miles, north of the Mexican border to Imperial Valley. The Coachella Main Canal branches from the All-American Canal 20 miles west of Yuma and runs northwesterly 123 miles to the Coachella Valley. The branch canal was completed in 1948, and its underground lateral system in 1954.

Imperial Valley crops include alfalfa hay and seed, cotton, sugar beets, barley, flax, cantaloupes, sorghum, and fresh vegetables for the Nation during the winter months. The Coachella Valley produces winter vegetables, dates, table grapes, citrus fruit, and cotton.

YUMA AUXILIARY PROJECT

Containing 3,406 acres devoted to growing grapefruit, oranges, and lemons, this project lies on the Yuma Mesa in Arizona about halfway between Yuma and Mexico. As authorized in 1917, the project comprised 45,000 acres, of which only a limited area could be served through constructed works. Legislation passed in 1949 reduced the project's boundaries to include the present area because the remaining arable land could be better served through the Yuma Mesa Division of the Gila Project. Colorado River water for the project is diverted at Imperial Dam through the Gila Project's canal system.

GILA PROJECT

The Gila Project's 105,000 acres of irrigable valley and mesa lands lie along the Colorado and Gila Rivers in southwestern Arizona.

Project water is diverted at Imperial Dam for delivery to the Yuma Mesa and Wellton-Mohawk Divisions of the Gila Project. The Gila Gravity Main Canal conveys this water from the dam 21 miles southeast to the Yuma Mesa Pumping Plant, where it is lifted 52 feet to the head of the Yuma Mesa distribution system. The Wellton-Mohawk Canal, diverting from the Gila Gravity Main Canal 15 miles below Imperial Dam, extends along the Gila River eastward for 18.5 miles, then branches into the smaller Wellton and Mohawk Canals.

The Gila Project system delivered its first water to the Yuma Mesa Division in 1943, and to the Wellton-Mohawk Division in 1952.

The Wellton-Mohawk Division's 65,000 acres of irrigable lands are along the Gila River and on the bordering Wellton Mesa. Three large pumping plants along the Wellton-Mohawk Canal lift water a total of 170 feet. Two small plants lift water an additional 69 feet to higher lands adjacent to the Mohawk Canal. Smaller relift pumps are scattered throughout the Division.

The Yuma Mesa Division is authorized for 40,000 acres of irrigable land, 25,000 on the Yuma Mesa and the remainder in the north and south Gila Valleys.

The Yuma Mesa grows citrus, alfalfa hay and seed, grapes, and grains. Alfalfa, cotton, flax, cantaloupes, winter vegetables, small grains, and Bermuda grass seed are grown on the Wellton-Mohawk Division. Sheep are brought from summer ranges into the area and are wintered on irrigated pastures of the project before being shipped to feed lots and markets. Cattle feed lots of various sizes operate in the area.

COLORADO RIVER BASIN SALINITY CONTROL PROJECT

Authorized by the Congress in 1974, the Colorado River Basin Salinity Control Project's goal is to prevent an increase in the salinity of Colorado River water—contributed about equally by man and nature. The program's Title I deals with salinity control measures below Imperial Dam near the International Boundary, and Title II deals with salinity control measures above Imperial Dam.

Title I features will improve the quality of Colorado River water delivered to Mexican farmlands under the 1944 water treaty between the two countries and as required by Minute 242 of the International Boundary and Water Commission. The major feature for accomplishing this is the 96-million-gallon-per-day membrane Yuma Desalting Plant, scheduled to go into operation in 1983. The plant will treat saline water drained from the Wellton-Mohawk Valley in southwestern Arizona and put most of it back into the river at Morelos Dam for delivery to Mexico. The plant, to be the world's largest, will make it possible to meet salinity standards at Morelos Dam as required by Minute 242. The specified salinity limits are now being attained by temporarily borrowing water from upstream reservoirs to replace the bypassed Wellton-Mohawk drainage waters below Morelos Dam.

Other major Title I features include replacement of the first 49 miles of the unlined Coachella Canal with a concrete-lined reach to salvage about 132,000 acre-feet of water annually now lost to seepage, and a protective and regulatory ground-water pumping plan for the South Yuma Mesa along the Mexican border. This well field will recover ground water for use in the United States and for meeting treaty obligations. These features are currently under construction.

Also included in the project is an intense effort by the Bureau of Reclamation to improve irrigation efficiencies in the Wellton-Mohawk Valley. This will result in a reduction in the amount of saline drainage water to be treated by the Yuma Desalting Plant.

The Title II program provides for expedited investigations of 12 salinity control units throughout the Colorado River Basin and authorizes four for construction. The Title II program is expected to remove about one-fifth of an average of 10 million tons of salt each year from the Colorado River system. This would prevent the salinity at Imperial Dam from increasing another 155 milligrams per liter. Salinity at the dam now averages about 820 mg/L.

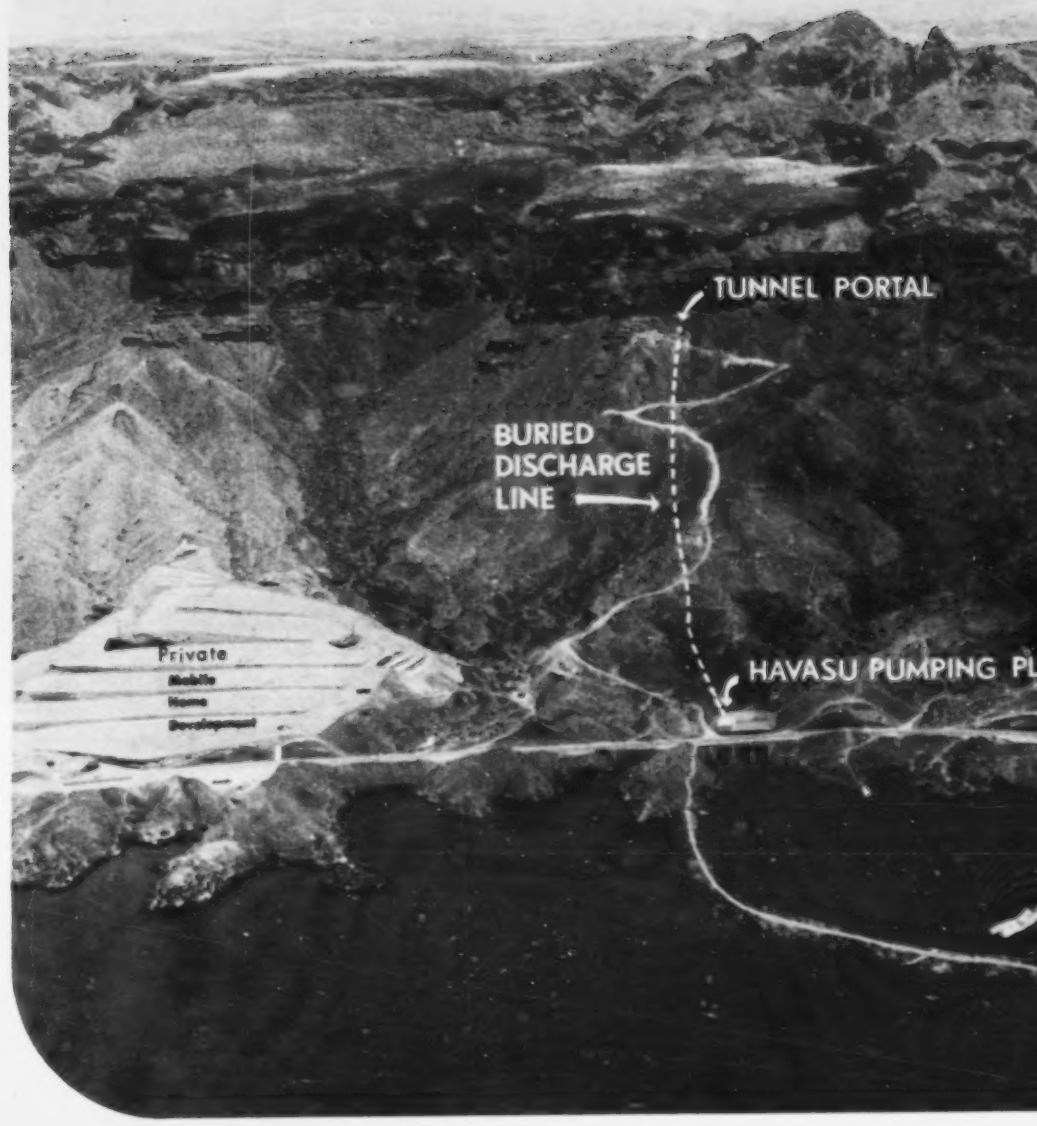
CENTRAL ARIZONA PROJECT

Authorized in 1968 and now under construction, the Central Arizona Project will provide a new supplemental water supply to central Arizona, averaging 1.2 million acre-feet of Colorado River water each year. This water will be used by municipalities, industries, Indian communities, and agriculture.

The Colorado River water will be pumped from Lake Havasu, a short distance above Parker Dam, into the 190-mile-long Granite Reef Aqueduct. This water will move in the aqueduct to the south side of the Salt River some 20 miles east of Phoenix. At this point, it will be pumped into the Salt-Gila Aqueduct and flow 58 miles to a location near the Picacho Mountains. From there it will be pumped into the 60-mile-long Tucson Aqueduct for delivery to the Tucson metropolitan area.

These aqueducts will consist of a series of canals, tunnels, river crossing siphons, and pumping plants. The water that is delivered in Tucson will have been lifted through an elevation change of about 2,000 feet from the elevation at Lake Havasu. The pumping plants will receive power from the 24.3 percent Federal share of the output of the Navajo Generating Station at Page, Arizona.

Proposed Havasu Pumping Plant, discharge line, and tunnel portal.



Other major proposed project features include Buttes Dam and Reservoir on the Gila River in Arizona, provision for CAP water regulation, flood control along the Salt and Gila Rivers in the Phoenix area, provisions for additional water use in New Mexico, and a distribution system to deliver project water to the Central Arizona Indian Tribes.

The Colorado River water delivered by this multipurpose Reclamation development is expected to significantly reduce the overdrafting or "mining" of ground water in central Arizona. Project construction began in 1973. Present schedules provide for delivery of Colorado River water to central Arizona beginning in 1985.

NAVAJO GENERATING STATION

Electrical energy for pumping Colorado River water through the Central Arizona Project delivery system will come from the Navajo Generating Station in northeastern Arizona near the city of Page. Besides supplying the power requirements of the CAP, revenues from the sale of energy excess to the needs of the CAP will augment the Lower Colorado River Basin Development Fund.

The Secretary of the Interior was authorized and directed by Section 303 of the Colorado River Basin Project Act to recommend the most feasible plan for the construction of hydroelectric facilities, purchase of energy, purchase of entitlement to electrical plant capacity, or any combination thereof, including participation, operation, or construction by non-Federal entities.

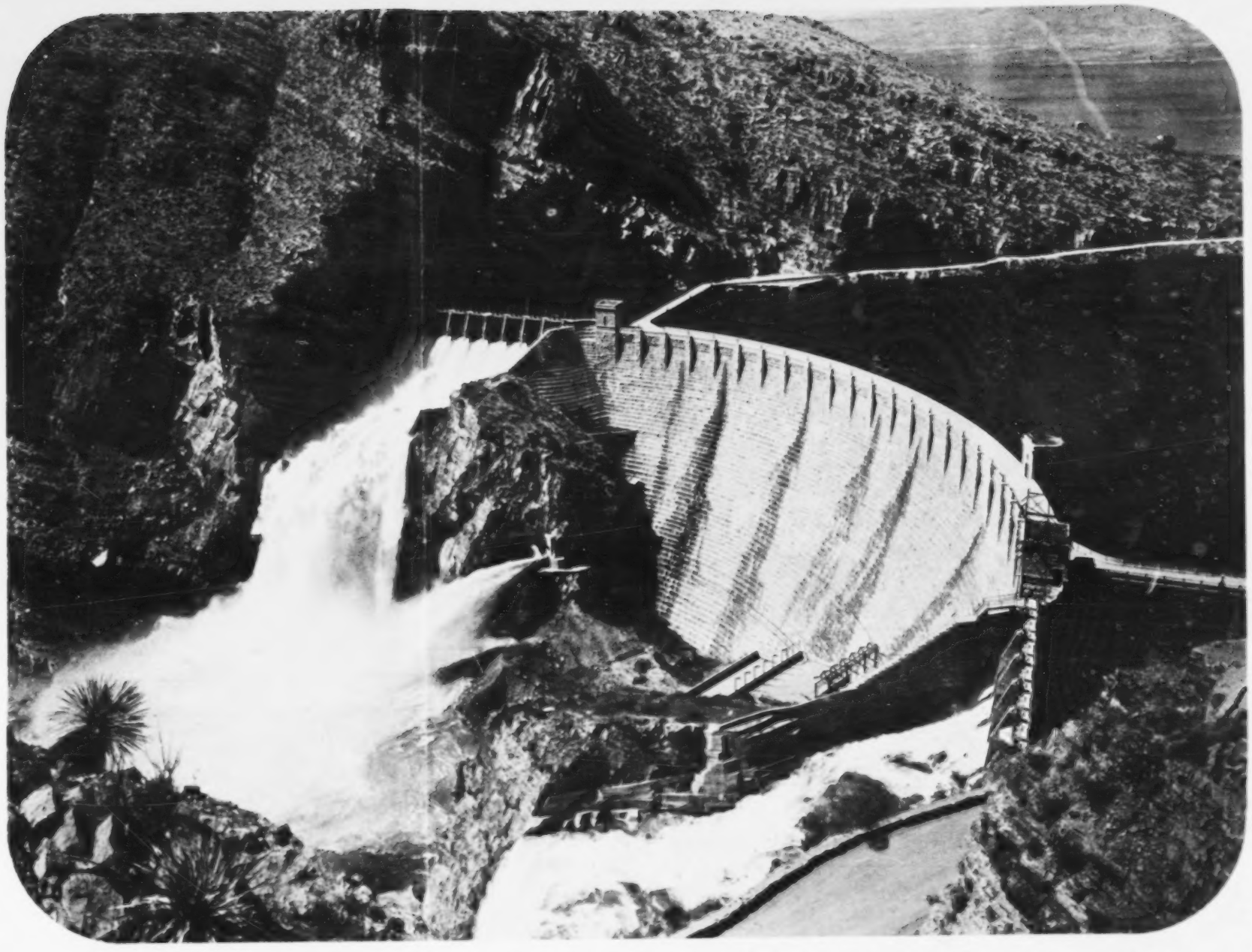
As a result of this legislative authorization, the Secretary, on December 12, 1969, signed contracts providing for participation by the United States in the Navajo Project, consisting of the Navajo Generating Station and associated transmission facilities. The coal-fired plant's present rating is 2,250,000 kilowatts, of which the United States' share is 24.3 percent, or 546,750 kW.

SALT RIVER PROJECT and ADJACENT AREAS

The Salt River Project in central Arizona, authorized in 1903, was Reclamation's first large multipurpose water resources project. The original project, including Theodore Roosevelt Dam and Powerplant on the Salt River, Granite Reef Diversion Dam downstream, and a repaired and revamped canal network, was placed in service in 1910 and completed in 1911. The project, with subsequently constructed diversion works, canals, laterals, and several smaller powerplants along the canals, was turned over to the Salt River Valley Water Users' Association for operation in 1917.

Between 1923 and 1930, the Association constructed Horse Mesa, Mormon Flat, and Stewart Mountain Dams on the Salt River below Theodore Roosevelt Dam. Cave Creek Dam was built in 1923 by local public and private organizations for flood control. Private interests constructed Carl Pleasant Dam in 1928 on the Agua Fria for irrigation. That same year, the Bureau of Indian Affairs completed Coolidge Dam on the Gila River to store water for the San Carlos Irrigation Project and to generate power. Then between 1936 and 1939, the Bureau of Reclamation built Bartlett Dam on the Verde River, a major tributary to the Salt River. Horseshoe Dam, upstream from Bartlett, was completed in 1946 as a World War II emergency measure and is now used by the Salt River Valley Water Users' Association.

The Salt River Project encompasses 262,935 irrigable acres of land. Another 78,531 acres adjacent to the project receive supplemental water from the project.



Theodore Roosevelt Dam, one of Reclamation's first major structures, was completed 60-plus years ago and is still providing yeoman service.

Private developments, largely irrigated from wells, include about 300,000 acres. Winter fruits and vegetables, alfalfa, cotton, grain, citrus, and livestock are the project's main agricultural products.

COLORADO RIVER FILMS

The Bureau of Reclamation has produced a 16-millimeter sound motion picture, *THE STORY OF HOOVER DAM*, on the development of the lower Colorado River Basin. Prints may be borrowed free of charge; however, users are required to pay return postage. Address requests to Bureau of Reclamation, Code D-922, P.O. Box 25007, Denver, Colorado 80225.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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LOWER COLORADO RIVER RECLAMATION

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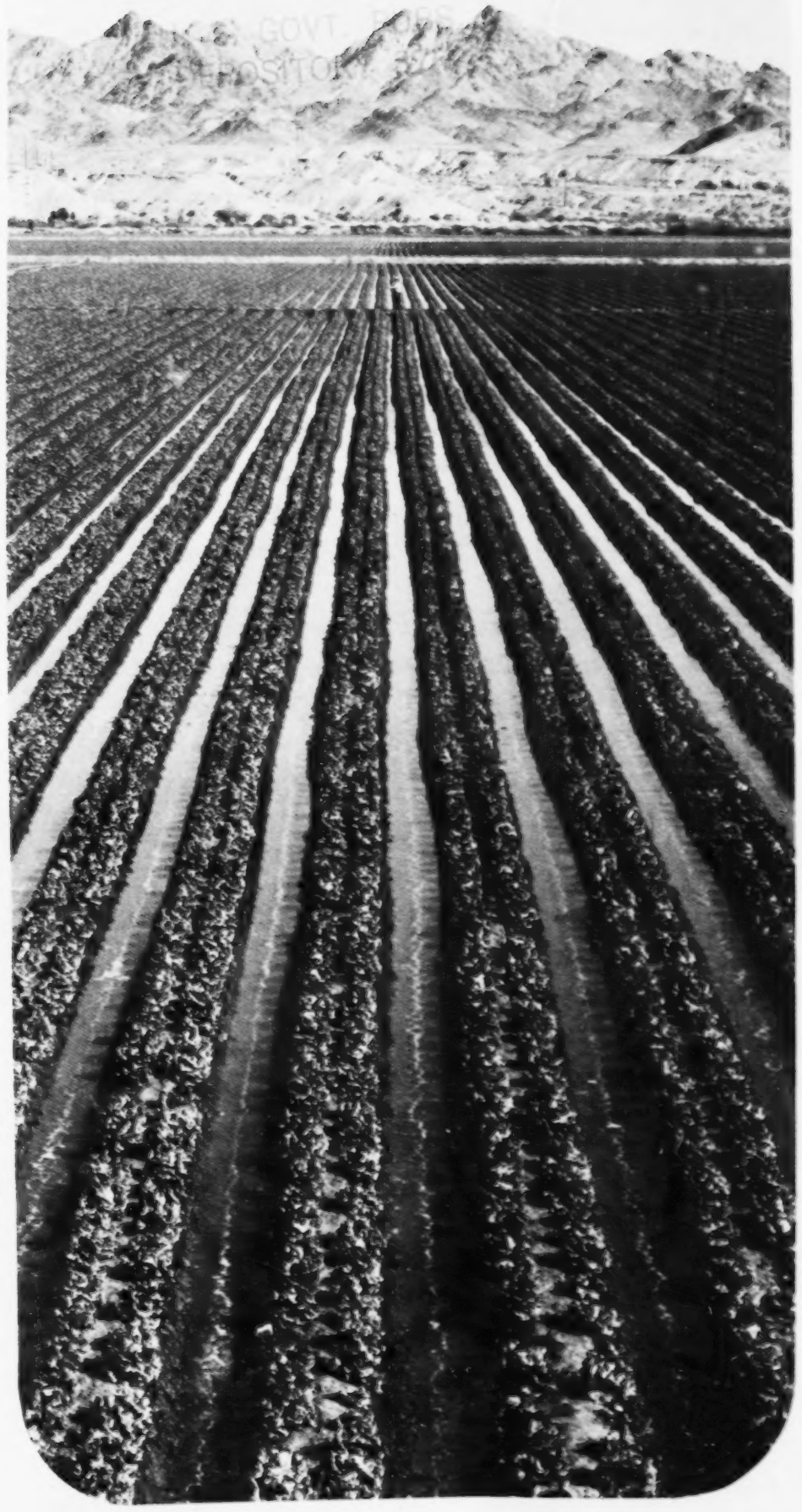

U.S. DEPARTMENT
OF THE INTERIOR

Bureau of Reclamation

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